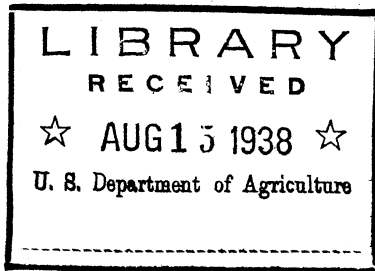


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Preparation of

# CABBAGE FOR MARKET

U.S. DEPARTMENT  
OF AGRICULTURE  
FARMERS' BULLETIN

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**C**ABBAGE IS CLASSIFIED according to type as Danish, domestic, pointed, red, and savoy. The first three types are the most important commercially.

Solidity of the heads and color of outer leaves are the most reliable characteristics for determining the proper stage to harvest cabbage.

A large part of the cabbage crop is now graded and packed in accordance with the requirements of United States standards, and cabbage is rather generally quoted and sold on the basis of these standards.

Most of the early and midseason cabbage is packed for shipment in containers, the most widely used being the western crate, the western half crate and the 1½-bushel hamper. Northern late cabbage is generally shipped in bulk or in sacks.

Refrigerator cars are now used for most rail shipments of cabbage. Loads of cabbage in containers are usually covered with crushed or chunk ice for shipment during warm weather. Refrigeration of northern storage cabbage shipments is not necessary during the winter, but often cars are preheated.

It is estimated that more than half of the cabbage crop now moves to market by motortruck.

About one-eighth of the total commercial cabbage crop is used for sauerkraut manufacture, principally in northern producing States. United States standards for cabbage for sauerkraut manufacture were issued in 1932.

A large percentage of the Danish crop of cabbage is stored in northern producing States for supplying the markets during the winter.

Federal-State inspection of shipments of cabbage is available for a small fee to financially interested parties in most of the commercial cabbage-producing areas, and Federal inspection is available at receiving markets.

# PREPARATION OF CABBAGE FOR MARKET

RAYMOND L. SPANGLER, *associate marketing specialist, Bureau of Agricultural Economics*

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**C**ABBAGE, one of the important vegetable crops in the United States, is grown commercially in about 30 States. An average of 182,068 acres was grown in the 5-year period 1933-37, and the average production on this acreage for the same period totaled 1,139,620 tons. The farm value of the cabbage crop in 1937 was estimated to be \$15,928,000 and has averaged \$15,616,000 for each of the last 5 years. The demand for high-quality cabbage by consumers has made it necessary for growers to give closer attention to the marketing of this crop.

## MARKET TYPES OF CABBAGE

Cabbage may be classified commercially into five distinct types: Danish, domestic, pointed, red, and savoy. This classification is based entirely upon terms adopted by the trade and has no direct connection with horticultural varieties or the regions where grown. The first three types have the greatest commercial importance.

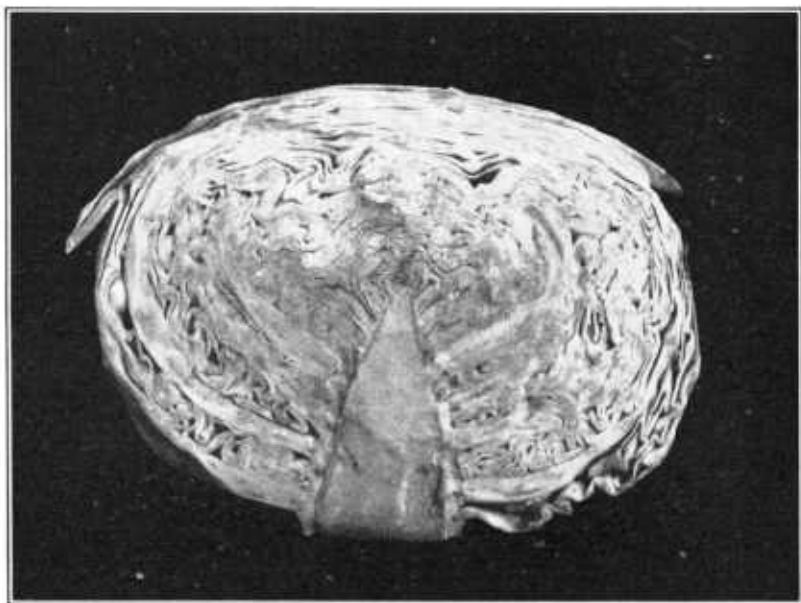
The term Danish or Hollander is commonly applied to the solid-headed, late-maturing cabbage, which is generally used for storage and late-marketing purposes. Heads of this type usually have the leaves closely compacted and overlapping at the crown. They are comparatively smooth and solid around the base between the midribs of the leaves, even after successive head leaves have been stripped off. The heads are usually round or oval, but at times are somewhat flattened. The outline of the head as seen from above is smooth and regular. The midribs of the outer leaves generally extend outward and upward at an angle from the stalk, so that the base of the head appears rounded or elongated.

Domestic cabbage is usually not so compact as Danish, but the

<sup>1</sup> The first edition of this bulletin was written by Charles W. Hauck, who resigned in 1925. For a more complete discussion of the marketing of cabbage, see Department Bulletin No. 1242, *Marketing Cabbage*, copies of which may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 15 cents per copy.

heads are reasonably hard. They are flat or round, and when the crown leaf is removed the head appears somewhat angular in outline. The leaves are usually crinkled or curled and do not overlap so far at the crown as in Danish cabbage. The head is usually somewhat soft at the base between the midribs of the leaves. The leaves tend to form a right angle with the stalk, or they even droop or curve downward slightly before curling upward to form and envelop the head. Thus they give the base of the head a flattened appearance.

The shape of the heads, particularly those of Danish type, is subject to considerable variation, dependent upon soil, climatic, or cultural conditions. At times it is difficult to distinguish heads



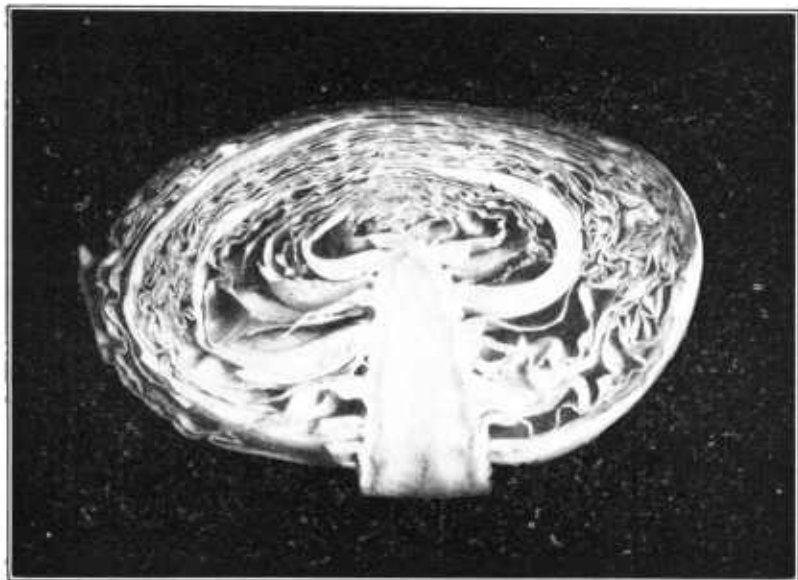
BAE 7935

FIGURE 1.—Cross section of typical head of Danish or Hollander cabbage. Heads are very compact. The leaf midribs extend outward and upward from the stem. In the flatter types of Danish or Hollander this is not so pronounced.

of Danish cabbage from those of domestic type when judged by the shape alone. The most accurate method of differentiation under these conditions is to base the identification largely upon the characteristics displayed by a vertical cross section through the center of the head. The typical characters of these two types of cabbage are shown in figures 1, 2, 3, and 4.

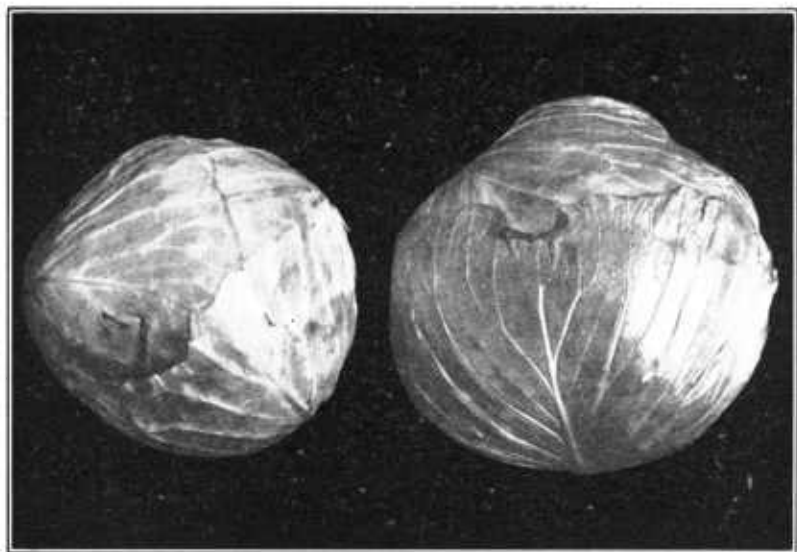
Early-maturing varieties of domestic are grown almost entirely for marketing as fresh cabbage. Late-summer or fall varieties are grown both for market and for sauerkraut purposes.<sup>2</sup>

<sup>2</sup> For a detailed description of principal varieties of cabbage see U. S. Department of Agriculture Miscellaneous Publication No. 169, *Description of Types of Principal American Varieties of Cabbage*. Copies may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 50 cents a copy.



BAE 8074

FIGURE 2.—Cross section of typical head of domestic cabbage. The heads are not so compactly formed as in Danish cabbage. The leaf midribs form a right angle with the stem or curve downward slightly.



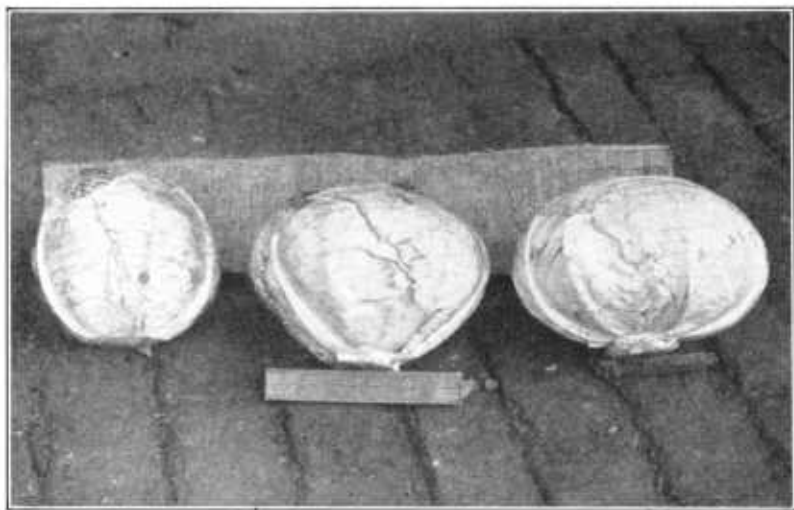
BAE 8075

FIGURE 3.—Danish cabbage (left) is smoothly circular in outline as viewed from above. Domestic cabbage (right) is somewhat angular in outline.

In the North and West both Danish and domestic types are grown extensively, whereas most of the cabbage grown in the South Central States is of the domestic type.

The pointed type is readily recognized by the conical or pointed shape of the head, together with the comparatively smooth surface of the leaves. This is the leading type produced in some of the southeastern districts and is grown to some extent in a few of the Western States. The two most important varieties of this type are illustrated in figures 5 and 6.

The red type is known by its red or purple color. Heads of the dark-red or purple varieties are as hard as Danish cabbage, but the lighter-red varieties are only fairly hard or are comparable in this respect to the domestic round type. Red cabbage is grown to a limited extent as a field crop in a few States and as a market-garden crop near many large cities. It is used principally for pickling and salad purposes.



BAE 1775B

FIGURE 4.—Three heads of Danish or Hollander cabbage, illustrating the typical round, balloon, and oval shapes.

The savoy type is grown only in small quantities. The normal crumpling or blistering of the leaf tissue throughout the leaves and head readily identify it. The heads are of a yellowish-green color and as a rule are not much more compactly formed than head lettuce, although some varieties are reasonably hard. It is a fairly important crop near New York City and on Long Island.

#### TIME AND METHODS OF HARVESTING

In the northern sections the solidity of the head is the usual characteristic by which the proper stage to harvest is determined, although with some varieties the color is also a factor, the crown or top of the head turning a lighter shade of green about the time of full develop-

ment. Cabbage is usually considered ready to cut when the green cover leaves begin to curl back slightly, exposing the whiter leaves beneath. Cabbage at this stage is about as hard and heavy as it will become without bursting and without being too crisp and brittle for good handling.

Cabbage grown as a truck crop frequently is harvested as soon as it has attained sufficient size to be placed upon the market, regardless of its stage of maturity. Growers, especially in southern areas, often harvest the heads while they are still soft, in order to get higher prices at the beginning of the season, but in most cases this means a considerable loss in tonnage. Moreover, the quality of the product is inferior. Shipment of such stock is likely to weaken the market and perhaps limit the demand, as it causes the consumer to curtail his purchases. Stock cut when soft or immature wilts badly, and when displayed for sale is unattractive in appearance. On the other hand, cabbage that is not harvested soon enough becomes over-ripe and must be closely trimmed. Such heads have a white appearance and are very tender. They are too brittle for long shipment.

The common practice throughout the northern cabbage sections is to allow the crop to stand until all of it can be harvested at one or



BAE 177B

FIGURE 5.—The head on the left is Charleston Wakefield. The abruptly pointed head on the right is Jersey Wakefield.

two cuttings. Throughout the South and those sections that supply the midseason market, two or more cuttings are necessary, because in these districts the ripening often extends over a long period.

In the northern districts, the harvesting of Danish or Hollander cabbage often continues until the middle of November. Freezing temperatures may occur before the harvesting is completed. The outer leaves which show evidence of freezing injury are trimmed off before the cabbage is loaded. In case the freezing extends into the head, cutting should be discontinued for a time. If favorable weather follows, the heads will thaw, and may show no evidence of injury when the outer leaves are trimmed off.



The most common method of harvesting is to sever the head from the stem with a large butcher knife (fig. 7). Some growers use



BAE 1771

FIGURE 6.—Cross section of head of Charleston Wakefield cabbage. The air spaces between the leaves are typical of pointed cabbage.



BAE 6434

FIGURE 7.—Common method of harvesting is to sever the head from the stem with a large butcher knife.

hatchets, long-handled spades, tobacco shears, or knives of various descriptions, commonly patterned after the semicircular chopping

knife or meat cleaver. In some sections a long-handled, spadelike knife known locally as a spud, is a popular harvesting tool (fig. 8).

Cutting tools with long handles permit the harvesting to be done with comparative ease and rapidity, but are not conducive to careful work, as many of the heads are cut either with too long a stem or with part of the base chopped off. The use of a heavy knife is more satisfactory. Heads with deep slices cut off at the stem end, and with the loose outer leaves falling readily from the heads detract from the good appearance of a carload, to say nothing of increasing the likelihood of decay.



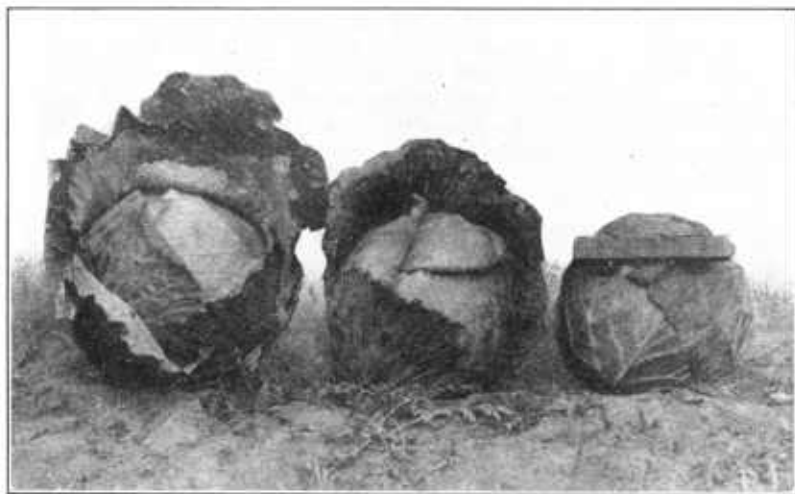
BAE 33177

FIGURE 8.—The long-handled spadelike knife permits harvesting with comparative ease but is not conducive to careful trimming.

Cabbage intended for immediate shipment should be trimmed to the desired number of wrapper leaves. Much of the southern new cabbage is now shipped with four to seven green wrapper leaves attached, as illustrated by the head on the left in figure 9. Late-crop cabbage, however, is usually trimmed to not more than four closely fitting wrapper leaves. Any leaves showing material damage from worms, disease, or other cause should be removed even though this means close trimming. The green outer leaves protect the heads. They can be removed at destination if this is necessary to give the lot a fresh appearance. Stems should be one-quarter to one-half inch in length.

In harvesting late-crop cabbage the usual procedure is to cut and trim the heads at one operation, putting the heads from two or more rows into one windrow. Some growers then collect the heads in field containers, after which they are loaded on a wagon or truck and hauled from the field (fig. 10). Many growers prefer to load in

bulk from the field. The conveyance is drawn between the windrows, and one person on the ground tosses the heads to another on the load.



BAE 1768

FIGURE 9.—A large percentage of the southern new cabbage crop is trimmed to four to seven green wrapper leaves, as illustrated by the heads on the left and in the center; the right-hand head is closely trimmed.



BAE 33178

FIGURE 10.—In northern producing areas cabbage is sometimes hauled from the field in containers, although it is more often loaded in bulk.

When loading closely trimmed heads in this way care should be exercised to prevent bruising. Bruised tissues become watery in

appearance and later turn dark; often decay follows. The heads should not be allowed to fall into the bed of the conveyance but should be placed carefully on the load.

In southern sections, where it is customary to ship cabbage in hampers or crates, the containers are often packed in the field or at the field's edge as the heads are cut. In the Carolinas and Virginia it is customary to place the heads in carts that are driven ahead of the cutters. In some other southern producing sections the heads are collected in field crates and hauled to the edge of the field on sleds, where the cabbage is either packed in containers or hauled to a nearby packing shed for further grading and packing (fig. 11).



BAE 30709

FIGURE 11.—In some southern producing sections cabbage is collected in field crates and hauled on sleds to the edge of the field, where it is either packed for shipment or loaded on a conveyance to be transported to shippers' packing sheds or loading platforms for final grading and packing.

#### NECESSITY FOR CAREFUL GRADING

Care should be exercised in the handling of cabbage, whether it is to be shipped in containers or in bulk. The attractiveness of a neatly trimmed carefully graded lot of cabbage pays for the extra time and attention required in the preparation.

No one factor is more important in marketing fruits and vegetables than careful grading. High standards, consistently adhered to, build goodwill and create confidence. It is recognized increasingly by growers and shippers that fresh, sound, firm cabbage brings higher returns than soft, puffy, leafy, or worm-eaten heads, and that it pays well to discard such defective heads before shipping (fig. 12). They should be left in the field at cutting time. The arrival on the markets of large quantities of cabbage that is poorly graded or in bad condition quickly depresses the demand. On the other hand deliveries of uniformly good-quality cabbage stimulate consumption.

A considerable part of the crop in many States that supply early and midseason cabbage is now graded and packed at shippers' packing sheds or loading platforms, usually located on railroad sidings (fig. 13). After many defective heads are eliminated in the fields



BAE 33463

FIGURE 12.—Burst heads (left) and heads showing slime (center) or bad worm injury (right) should be discarded.



BAE 20713

FIGURE 13.—Of the early and midseason cabbage crops a considerable part is hauled to shippers' packing sheds or loading platforms for final grading and packing.

by the cutters, the graders at packing sheds give the heads another final inspection before they are packed for shipment. Thus defective heads missed by the cutters are discarded, and careful work on the part of the graders enables the shipper to pack a more uniformly graded and higher-quality product.

Small or mediumweight cabbage is the most desirable market size. Heads of pointed cabbage weighing 1 to 4 pounds and heads of Danish and domestic cabbage weighing 2 to 6 pounds are preferred by receivers. When loading cabbage in bulk, a certain amount of sizing can be done at the car, as most shippers in the Northern States instruct their loaders to reject all heads estimated to weigh less than 2 pounds. Heads weighing more than 8 pounds are undesirable.

Extreme irregularity in size should be avoided. Shipments from northern sections often are especially selected for size, grading "small," "medium," or "small to medium." In some cases, when the field run shows a considerable number of large heads, the largest are hauled separately. Shippers frequently load out straight cars from one field. This often results in a more uniform grade and size than if the car were loaded from several fields without grading.

When cabbage is shipped in containers it is particularly important to pack large, small, and medium heads separately. In some sections, notably the southern Ohio district, it is customary to size the cabbage in this way before packing, so that the crop finds a more ready market and brings increased returns. The retail trade prefers fairly uniform sizes because it is easier to set a price on each head and because uniform sizes permit the selection of crates containing the sizes wanted. The premium paid for the medium sizes usually more than offsets any discount on the very small and very large heads and pays well for the slight increase in the time required in the sorting and packing operations.

A large percentage of the cabbage crop is now graded and packed in accordance with the requirements of United States standards, and cabbage is rather generally quoted and sold on the basis of these standards. The standards are revised from time to time to keep abreast of new developments and changes within the industry. Copies of the latest standards may always be obtained from the Bureau of Agricultural Economics, United States Department of Agriculture, Washington, D. C.

The standards in effect in 1938 for cabbage for market provide requirements for U. S. No. 1 and U. S. No. 1 Green cabbage. The principal grade factors taken into consideration in U. S. No. 1 grade are type, trimming, solidity, freedom from withering, puffiness, bursting, soft rot and seedstems, and damage caused by discoloration, freezing, disease, and insects. A provision for designating cabbage as U. S. No. 1 Green was added to the standards in 1934 when green cabbage became so popular among consumers. The requirements for this grade are the same as for U. S. No. 1, except that the heads must have at least a fairly good green color and may have as many as seven wrapper leaves. Much of the new cabbage from the Southern States is now packed and sold as U. S. No. 1 Green cabbage.

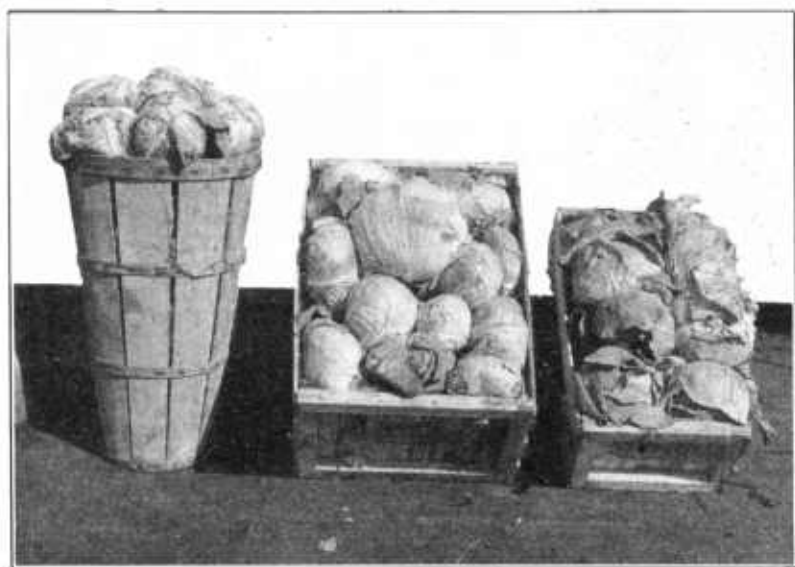
In addition to the quality requirements in the standards, provisions are made for classifying the cabbage as to size in connection with the grade by use of the terms "small," "medium," and "large." The size designation is dependent upon the weight of the heads and the type of cabbage.

The United States standards furnish a common terminology that may be used in describing a given shipment of cabbage, and provide a basis for contracts, sales, inspections, adjustments, etc. It may

readily be seen that if a lot of cabbage is described as U. S. No. 1 Medium, a clear and definite understanding of both the quality and size of the cabbage comprising the shipment may be had by both buyer and seller without actually seeing the lot. The intelligent use of standardized grades not only minimizes the possibilities for misunderstanding but also for fraud, deception, and sharp practice. Most of the important cabbage-producing States have adopted the United States standards for cabbage as official State standards, using them as the basis for official inspections.

#### CONTAINERS

Most shipments originating in the early and midseason sections as well as a considerable part of the shipments from the late-producing States are made in containers. During recent years there has been a



BAE 33467

FIGURE 14.—Three widely used containers for shipping cabbage are the  $1\frac{1}{2}$ -bushel hamper (left), the western crate (center), and the western half crate (right).

decided shift from the large, unwieldy types of crates of various dimensions to a few smaller types. The western crate and half crate have become the most popular shipping containers in Texas, Mississippi, Louisiana, California, Colorado, and parts of Florida (fig. 14). The western crate holds from 85 to 100 pounds and the half crate about 45 pounds of cabbage depending upon type, solidity of the heads, and method of packing. Typical inside measurements for these crates are 13 by 18 by  $21\frac{5}{8}$  inches and 9 by 13 by  $21\frac{5}{8}$  inches, respectively.

The  $1\frac{1}{2}$ -bushel hamper is the most widely used container for the small pointed-type cabbage shipped from Florida, South Carolina, New Jersey, and southeast Virginia (fig. 14). This package holds from 45 to 50 pounds of cabbage and its shape is adapted to close packing of pointed-type cabbage.

Other containers that are still important in certain producing areas include the half-barrel crate, holding from 55 to 60 pounds of cabbage, used to some extent in southeastern producing States, the pony crate, holding about 60 pounds of cabbage, used almost exclusively for shipping the Tennessee crop and to some extent in other producing areas in the Mississippi Valley, the wire-bound crate designed to hold about 50 pounds of cabbage, used principally in southeastern Ohio, and the New England box, holding slightly less than a bushel, used in the New England States.

Whatever the type of crate used, it should be neatly and securely constructed of substantial material. Flimsy or damaged containers have a poor appearance and often necessitate extra handling and reneiling after they reach the markets.

The heads should be placed in the crate with the stems out, and arranged in orderly layers. They should be pressed firmly but carefully into position so as to make a tight pack. Crushing and excessive bruising should be avoided. The crate should be well filled so that the cover slats will show a slight bulge, thus preventing damage from shifting of the contents during handling and transit.

Sacks are used more or less in most cabbage-producing sections as containers for cabbage. Where formerly sacks holding 100 pounds or more of cabbage were used extensively, there has recently been a decided turning toward the use of smaller sacks. A burlap or jute sack designed to hold 50 pounds of cabbage is now the most widely used container in New York, and its popularity is spreading to other producing areas. Most of the cabbage now marketed in sacks from all sections is packed in either 50- or 100-pound sizes. Sacks are suitable containers for cabbage if they are handled carefully so as to avoid bruising the heads. The smaller sizes of sacks now used are a decided advantage in this respect over the large sizes formerly used. Truckers and handlers are less likely to drop the lighter-weight packages when loading and unloading.

#### METHODS OF LOADING CARS

Refrigerator cars are now used for most rail shipments of cabbage, although occasionally ventilated box or stock cars are used for short-distance shipments. Practically all shipments of early and midseason cabbage move under refrigeration as does most of the late crop from the Northern States marketed during the early fall months. Early and midseason cabbage wilts and deteriorates rapidly in market quality unless kept cold and moist. During the late fall and winter, refrigeration of northern late cabbage is not necessary, but it is often advisable to protect shipments against freezing during cold weather. Carriers' Protective Service is available on some railroads during periods of cold weather if the destination is within heater territory.

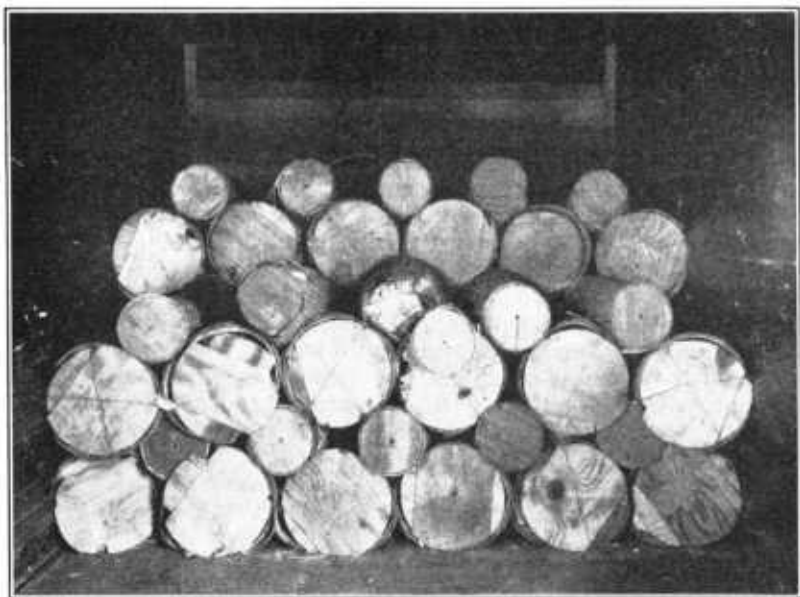
In addition to providing proper temperatures for cabbage shipments, provision should be made for adequate ventilation and free circulation of air as these are deterrents to the development of disease organisms and other deterioration.

When crated cabbage is loaded a space of 2 inches or more should be left between the rows of packages to permit free circulation of air throughout the load. Each layer of crates should be stripped crosswise of the car with strong wooden strips securely nailed to



the tops of the crates. Cabbage in western crates is commonly loaded on edge in refrigerator cars, 6 rows wide and 3 layers high, about 16 stacks making a total of 288 packages per car. Sometimes cars are loaded with 4 layers instead of 3, the total number of packages being about 384 per car. Some shippers space equally 5 rows of western crates across the width of the car and place them 4 layers high. The three lower layers are loaded on edge while the top layer is placed upright with bulge up. The average refrigerator car so loaded will have about 320 packages.

Western half crates are usually loaded 7 or 8 rows wide and 4 to 6 layers high, the count per car ranging from about 512 to 600 crates.



BAE 4802

FIGURE 15.—Damage frequently occurs in transit when hampers are loaded on the sides.

One and one-half bushel hampers are commonly loaded in the ends of the car on sides, lengthwise, alternate hampers reversed, 7 rows wide and 4 or 5 layers high. With this method of loading, often some of the containers in the bottom of the load become crushed in transit (fig. 15). Hampers loaded on end, 2 or 3 layers high, with tops and bottoms alternating, will usually carry fairly well. The number of  $1\frac{1}{2}$ -bushel hampers to the car varies from 350 to 500, depending upon the method of loading and size of the car.

The usual method of loading pony crates in the Mississippi Valley is piling them 7 rows wide and 3 or 4 layers high, 400 to 460 packages per car.

Icing practices vary in different producing sections and in the same section, depending upon weather conditions. It is common practice, however, to ice the tops of loads of crated cabbage in early and midseason areas. In most shipping sections from 4 to 8 tons of ice are placed over the tops of the loads. Snow or crushed ice is

more satisfactory than chunk ice for top icing as it is less likely to damage the packages in transit.

Practices also vary with respect to the use of ice in the bunkers. Often shippers rely on top ice alone to maintain the proper temperatures during the transit period. During extremely warm weather, however, many shippers require in addition that bunkers be filled with ice before the cars are rolled. Bunkers are almost always iced to capacity for bulk loads and loads of sacked cabbage in periods of warm weather.

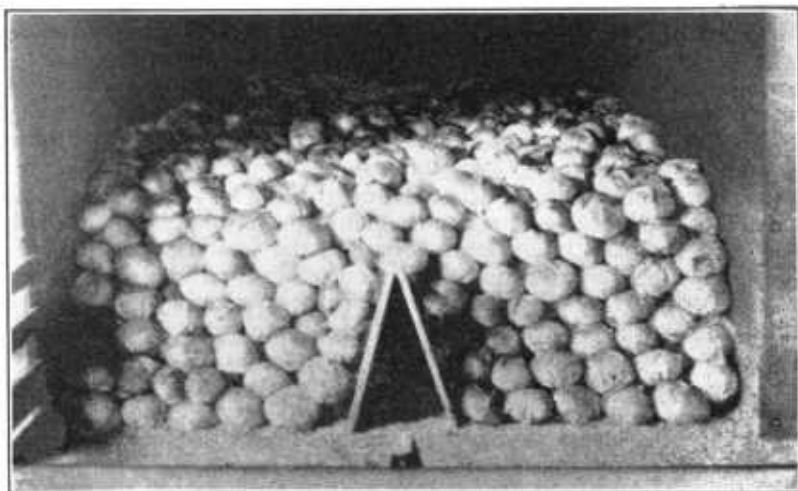
Methods of loading sacked cabbage depend largely upon custom in the various producing sections. As a general rule most cars are loaded with 24,000 pounds of cabbage—the carlot minimum applying in most States. Therefore the usual loading is 240 100-pound sacks and 480 50-pound sacks. A satisfactory method of loading 50-pound sacks employed in New York State, as well as in some others, is to place 7 rows lengthwise of the car and pile them 4 or 5 layers high in the ends of the car and stack them irregularly between doorways. Some Wisconsin shippers load 4 layers, the lower layer on end, 8 rows wide, and the remaining 3 layers crosswise. Usually 100-pound sacks are loaded the full length of the car, the sacks lying flat, crosswise, 3 rows wide and 4 or 5 layers high. In early and midseason producing areas bunkers of cars loaded with sacked cabbage should usually be iced to maintain a relatively low temperature during transit. It has recently become usual for some southern shippers to place snow or crushed ice over the tops of loads of cabbage in sacks.

Many of the carlot shipments of cabbage, particularly in northern late-producing areas, are loaded in bulk. For early-fall shipments from the northern States and for bulk shipments in the early and intermediate States, A-type slatted ventilators should be used (fig. 16). These ventilators are constructed along the floor in the center of the car before loading begins. There is little uniformity in their dimensions, but the most common type is 2½ to 3 feet high and about 1½ to 2½ feet across the base. In loading cars thus equipped, it is advisable to leave about 2 or 3 feet of the frame open at the top between the doorways to permit the free circulation of air in the car, thereby reducing the possibility of the top of the load becoming discolored during transit.

When bulk-loading southern new cabbage on which a number of green wrapper leaves are left attached to the heads it is difficult to arrange the heads so as to make an attractive load. Shippers usually pile them in the car more or less haphazardly. However, in loading heads of well-trimmed cabbage it is considered good practice to place each head individually, carrying the cabbage back from the door in baskets or crates. This may necessitate having two men in the car, but it prevents bruising and gives the carload an attractive appearance. The load is usually built up in successive benches 3 to 5 feet in width, extending across the car. The heads are carefully arranged with stems down in such a way as to form a smooth slanting face to each bench. Cars loaded carefully in this manner are neat and attractive. In some cases only the heads forming the front of the bench are placed individually, the remainder of the bench being built up without regard to the position of the heads.

The practice of loading closely trimmed heads by tossing them haphazardly into the car causes much bruising and mechanical injury and thus increases the possibility of the development of decay in transit. Cars so loaded are unattractive in appearance.

In northern producing areas it is necessary to protect shipments from freezing injury during the cold winter months. Heater service is often employed for this purpose. For a short haul during cold weather cars are often preheated.



BAE 1763

FIGURE 16.—An A-type ventilating frame permits free circulation of air throughout the bulk load.

#### SHIPMENTS BY MOTORTRUCK

During recent years the quantity of cabbage transported to market by motortruck has increased decidedly. In fact, it is estimated that more than half of the movement of cabbage to market is by truck. In some sections, notably Long Island and New Jersey, practically the entire crop is trucked to market. In many other Eastern States considerably more than half of the crop is so shipped. Because of the extensive system of highways connecting producing sections with many of the large markets, cabbage can be loaded on trucks one day and offered to the receiving trade in the markets several hundred miles away the following morning.

Since motortrucks get the cabbage to market in a relatively short time, loading precautions are not so important as with rail shipments, where the transit period is usually much longer. But truck shipments should be protected from direct exposure to the sun's rays, as such exposure will cause the cabbage to dry out and wilt. If the cabbage is crated, it is well to leave some ventilating space between the crates in the load. Bulk shipments by motortruck are usually not to be recommended during warm weather except for short distances, as lack of air circulation may cause abnormal deterioration.

#### HANDLING CABBAGE FOR SAUERKRAUT MANUFACTURE

About one-eighth of the total commercial cabbage crop is used for the manufacture of sauerkraut. The industry is confined almost

exclusively to producing States in the North, and about three-fifths of the total sauerkraut is manufactured in New York and Wisconsin. In general only domestic-type cabbage is used for sauerkraut, although at times part of the Danish crop is diverted to sauerkraut factories, especially if the domestic supply is inadequate.

Sauerkraut manufacturers prefer large, well-matured, closely trimmed heads for making a good-quality product. The larger the heads the less the waste. Large heads also make longer shreds, which are considered a requisite to high-quality sauerkraut. Frequently growers do not use enough care in handling cabbage intended for sauerkraut manufacture. Heads that are badly bruised by rough handling require closer trimming and greater waste as bruised spots may become discolored before the heads can be shredded. A common complaint that sauerkraut manufacturers make against the handling practices of growers is the use of forks in loading and unloading. Unless a head is shredded very soon after a fork tine penetrates it the area surrounding the injury is likely to turn dark. Then unless the head is trimmed heavily the discoloration will show up in the manufactured product and lower its quality. Growers preferably should handle cabbage intended for sauerkraut manufacture by hand or should use wooden shovels or some other blunt tool that will not penetrate the heads in the loading and unloading.

United States standards for cabbage for sauerkraut manufacture were issued in 1932. These standards provide a basis for inspecting cabbage as it is delivered by the grower to the loading station or sauerkraut factory. The requirements for cabbage of U. S. No. 1 and U. S. No. 2 grades are specified in the standards. At factories where official inspection is requested on the basis of the standards, representative samples are drawn from growers' loads by the inspector, who separates the individual heads and ascertains the percentage of U. S. No. 1, U. S. No. 2, and Cull heads. The value of the load is determined by applying these percentages to the prices established in the contract for each grade. The price established for U. S. No. 1 cabbage is more than the prevailing flat-rate contract price and the price for U. S. No. 2 is lower. Nothing is paid for the cull heads for they are supposed to be kept at home. This system of contracting for sauerkraut cabbage on the basis of United States standards enables the growers to receive payment for the actual quality delivered, whereas under the flat-rate system growers of poor-quality cabbage are paid as much for a given quantity as growers of a high-quality product. Copies of the latest United States standards for cabbage for sauerkraut manufacture may be obtained from the Bureau of Agricultural Economics, Washington, D. C.

#### METHODS OF STORING CABBAGE

Only Danish or Hollander cabbage can be stored without excessive shrinkage. The bulk of the tonnage used for this purpose is grown in New York and Wisconsin. Houses for storing cabbage are more or less frostproof and are fitted with ventilators in the roof and along the walls at the ground. A driveway usually extends through the center of the house, with a row of bins along each side (fig. 16). These bins are commonly 3 to 4 feet in width, with double-slatted partitions between, so constructed as to give approximately 6 inches of ventilating space between the bins from top to bottom. In some

houses these compartments are considerably wider, in which case the cabbage is generally stored on slatted racks that fit into the bins. From one to four layers of heads are placed on each rack, and an air space of a few inches is left between the top layer of cabbages and the rack above. These racks aid greatly in the ventilation but add to the expense of handling and reduce the storage capacity of the house.

During severe weather it frequently is necessary to heat these storage houses. Stoves and coke heaters of the salamander type are used. If the open coke heater is used, the fire is lighted outside the building, and the salamander is moved inside after the smoke has cleared away. During severe weather or periods of wide fluctuations in temperature, storage houses require frequent attention.

Cabbage to be stored should be solid and should not show any yellowing, decay, mechanical injury, or other defects. If stored in these specially built warehouses, the heads should be trimmed to three to six tight wrapper leaves. Loose leaves interfere with ventilation, and thorough ventilation is essential to successful storage.

In some northern sections field storage is practiced extensively. The cabbage is cut with the stem one-half inch or more in length, leaving several loose wrapper leaves. The heads are placed one layer deep on well-drained sod land, closely packed together with the stems down. Then they are covered with a few inches of straw or hay, the depth of which is increased as the weather becomes colder.

Considerable quantities are held for short periods in barns or cellars, or piled outside in long ricks or against strawstacks. The cabbage is stacked 3 or 4 feet high against a ventilating rack or A-shaped frame and covered deeply with straw.

Upon removal from storage for shipment the stems are recut, and enough outer leaves are trimmed off to eliminate all defects and to give the heads a fresh appearance.

#### FEDERAL-STATE INSPECTION OF CABBAGE

Federal-State inspection of shipments of cabbage is available for a small fee to financially interested parties in most of the commercial cabbage-producing areas. Federal inspection is also available at receiving markets. Certificates are furnished to financially interested parties showing the grade and description of the shipment.

The use of official United States standards and the inspection service has greatly facilitated trading between shippers and dealers in the markets. The standards furnish a basis for contracts between sellers and buyers, and the inspection certificate indicates compliance or noncompliance with the quality provisions of contracts. Shipping-point certificates on shipments have discouraged receivers from making unwarranted rejections in the markets. The inspection certificate also aids in the settlement of disputes between shippers and buyers, and the detailed description of the shipment facilitates the settlement of damage claims against transportation companies. Federal-State and straight Federal certificates are accepted as prima facie evidence of the quality, grade, and condition of the shipment in all United States courts and in most State courts.

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